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UNITED STATES DEPARTMENT OF AGRICULTURE
Agricultural Marketing Service
Grain Division
Washington 25, D. C.

To : State Seed Control Officials

From: O. L. Justice, Head, Testing Section, Seed Branch,
Grain Division, Washington 25, D. C.

Subject: Variety Testing

We are sure that State seed control officials appreciate the tremendous value of proper varietal labeling of seed. No doubt you are also aware of the difficulties encountered in conducting field trials for variety determination in seed control work, especially the costs involved. All of us in seed testing and control work know too well that many seed lots are marketed under incorrect varietal designations some of which are the result of honest errors, some the result of carelessness, and some are outright attempts at substitution.

We firmly believe that correct labeling as to variety is so important that Federal and State control officials should do everything within their means to check on its accuracy. While considerable success can be attained by checking the seed characteristics of some kinds of crops the principal subject of this memorandum is field testing for variety determination. Some States have been engaged in field testing for several years and others have initiated similar work in recent years. A survey made in 1956 shows that at least 13 States, out of 33 replying, were conducting some field testing for variety last year. This is encouraging but it is obvious that other States should initiate a program of variety testing and the programs in all States should be expanded.

Approximately 5 to 15 years ago the Federal laboratory at Beltsville, Maryland made rather extensive plantings but owing to reductions in funds for this purpose and increased operating expenses our program has been curtailed considerably in recent years. It appears that if the same effective work is to be continued the States must assume a large proportion of the responsibility in making the tests. We not only encourage this but will be pleased to assist States just beginning the work in setting up their programs. Whenever State tests indicate violations of the Federal Seed Act this Branch would be anxious to use the results of the States' tests for enforcement purposes.

In the past, we have been unable to use certain results submitted by State control officials due to the methods used in making the tests, inadequate size of sample, etc. In order to make maximum use of the results we urge that these points be given careful consideration before the plantings are made. Attached are some comments on this subject which may be of interest to seed technologists and control officials.

Briefly, in seed control work variety testing is just as important as testing for other quality factors such as purity, germination, and noxious-weed seeds. The job to be done is so tremendous that it must be shared by the States and Federal government. We urge the States to initiate new programs and expand existing programs in this field of activity. The personnel of the Seed Branch, Grain Division, AMS, will be pleased to assist the States with their programs.

Attachment

O. L. Justice

COMMENTS ON VARIETY TESTING PROCEDURES USED BY THE SEED BRANCH,
GRAIN DIVISION, AGRICULTURAL MARKETING SERVICE,
UNITED STATES DEPARTMENT OF AGRICULTURE,
AND OTHERS

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1. Number of plants in a test.

We make an effort to obtain a minimum of 200 plants per sample, except for the large plants such as tomato and the vine crops of which we attempt to obtain at least 100 plants. The small number of the latter is due solely to the amount of space required for a test. If space is available, the same number of these kinds should be grown as of other kinds.

Several years ago Dr. B. E. Clark of the New York State Seed Laboratory made a study of the number of plants in a test for trueness to variety (See AOSA Proc., 1950, p. 89). It was his conclusion that fewer than 50 plants is undesirable because of erroneous conclusions which may be drawn as to the varietal purity of the sample and that more than 100 plants in a test increases the accuracy so little as to make the use of a greater number of plants questionable, from the standpoint of work and expense involved.

We have observed tests with considerably less than 50 plants and have felt that results of such tests are useful only when all plants are of a single variety. Certainly it is not safe to base action on a test of so few plants where a mixture of varieties is involved. We believe that a variety test is comparable to a germination test in which 400 seeds are used. However, for many tests, 400 plants would require so much space and work as to be hardly practicable.

2. Actual counts of plants.

We believe that in the interest of accuracy it is necessary to obtain actual counts of the number of plants in a test and also the number of plants of each variety present in the test. Tests conducted in some places are laid out so that actual counts cannot be made or can only be made with great difficulty. In such cases the person making the readings estimates the percentages of different varieties present. We place little confidence in the "results" of such tests.

3. Spaced plantings, unspaced plantings, and broadcast seedings.

Methods differ as to the way the plants are arranged in a field test. We have used spaced plantings in rows almost exclusively. By spaced plantings is meant plantings in which the plants are grown far enough apart to enable the person making the readings to obtain notes on individual plants, and to obtain accurate counts of plants. The length of row depends on the kind of seed and the space between plants. We have observed variety tests in which the seed was sown thickly, a heavy stand was obtained and the plants were not thinned. It was impossible to know whether one was observing individual plants or groups of plants, and accurate counts could not be made. Also, we have observed variety trials in which the seed was sown broadcast. It was not possible to obtain counts of plants in these tests. This type of test is satisfactory for demonstrations to farmers and others, but it is not, in our opinion, satisfactory for tests of varietal purity.

. Number of replications.

Although we have frequently not replicated our variety plantings, especially the vegetables, we recognize that it is a good practice to have two or more replications. If possible these should be in different parts of the field or different fields. This may result in obtaining a test where only a part of a field may be ruined by any one of a number of factors, and a replicate planting in another part of the field may develop in good shape. However, rows, or replications side by side frequently give a better impression of the plant characteristics than a single row. We have observed variety tests made by other stations and noted that some have been replicated and some have not.

. Thinning the plants in the row.

Attention to thinning methods should be observed, not only to obtain properly spaced plants, but also to make sure that there is no bias in the process. This may be done by "blocking-out" excess plants with a hoe to the desired distance between plants. Also, when plantings are made in "hills", it is desirable to thin to a single plant per hill. In order to eliminate bias in choosing which seedlings in a hill are to be removed, we have left the seedling nearest the head of the row in each hill, and removed those remaining. Thinning before the young plants begin to exhibit varietal characteristics helps to eliminate bias in the process.

We space plant all kinds of plants and thin where there are more than one seedling per hill. The work and space involved is greater than for some methods, but we believe the increased accuracy of the results compensates for this.

. Obtaining authentic check samples.

The matter of obtaining authentic check samples is important and in our opinion deserves the most careful consideration. Experience has shown that it is not always wise to assume that seed is authentic merely because it has been obtained from an experiment station or is represented to be certified seed. We have observed trials where such seed was definitely not as represented and was not suited for check purposes. In some instances, seed purchased on the open market and sometimes from unreliable firms, has been supplied by official agencies for check purposes. This could conceivably result in the check sample coming from the same lot of seed as the sample being tested.

. Use of authentic check samples.

It is often necessary and always desirable to have authentic check samples planted with the commercial samples under test. These checks should be replicated so that no commercial sample is too far removed from a check to be compared with it. There is no general agreement on how often a check should be planted. It is highly desirable to be able to view at the same time the sample under test and the authentic check of the same variety. It is frequently desirable to include check samples not only of the variety the commercial sample is represented to be, but also of similar varieties, or varieties which are believed to have been substituted for the variety under test.

8. Making the readings.

In many cases it is desirable or even necessary to make readings two or more times. This is because some variety characteristics may be quite apparent at one time and completely disappear later. The record of the test should contain some detailed observations on how the plants obtained differ from the variety as represented. It is not sufficient to merely state that a certain percentage of the plants were not the variety claimed. The characteristics to be recorded will necessarily be different for different kinds of plants. It may be helpful to list the characteristics to be observed and have forms printed or mimeographed. We have found this to be a help in that it reduces the amount of writing to be done in the field, where conditions for writing are difficult.

9. Cultural practices to be followed in variety testing.

Cultural practices used in variety testing may or may not be those commonly followed in the area. The important consideration is to grow the plants in such a way as to permit or accentuate expression of distinguishing varietal characteristics. Time of planting may be of considerable importance and may be entirely different from the time a farmer would want to plant to obtain a crop. Cultural practices and varietal characteristics to look for are matters which come with experience. However, specialists in the various crops at the experiment stations should be very helpful with such problems. Cultural details for the various crops must be developed.

10. Use of greenhouse in variety testing.

If available, a greenhouse can be very helpful in testing for trueness to variety. Plants can be started in a greenhouse for transplanting to the field later. Partial identification can be made in some cases in the seedling stage in the greenhouse. In some cases complete tests may be made in the greenhouse, as for instance, sweetclover under continuous light. Such tests frequently require only a flat or two of plants to obtain sizeable populations.

11. Use of planters for planting variety tests.

The small amount of seed usually planted in a single test makes it hardly worthwhile to use a mechanical planter. The time and trouble of removing the planting plates to make sure that no seed from the previous sample is left in the planter makes their use questionable. Planters have the advantage of planting fewer seeds in a narrower band than can usually be planted by hand directly from the packet.



